

NTMFD4901NF

Dual N-Channel Power MOSFET with Integrated Schottky

30 V, High Side 18 A / Low Side 30 A, Dual N-Channel SO8FL

Features

- Co-Packaged Power Stage Solution to Minimize Board Space
- Low Side MOSFET with Integrated Schottky
- Minimized Parasitic Inductances
- Optimized Devices to Reduce Power Losses
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

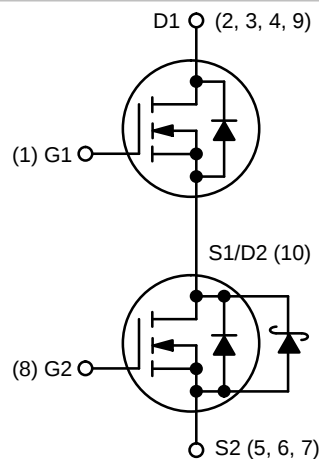
- DC-DC Converters
- System Voltage Rails
- Point of Load



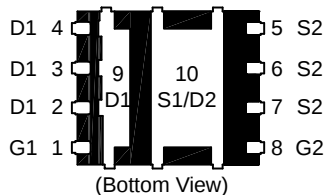
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<http://onsemi.com>

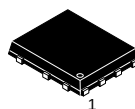
$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
Q1 Top FET 30 V	6.5 m Ω @ 10 V	18 A
	10 m Ω @ 4.5 V	
Q2 Bottom FET 30 V	2.35 m Ω @ 10 V	30 A
	3.5 m Ω @ 4.5 V	



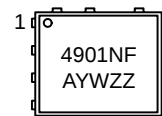
PIN CONNECTIONS



MARKING DIAGRAM



DFN8
CASE 506BX



4901NF = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter			Symbol	Value	Unit	
Drain-to-Source Voltage		Q1	V _{DSS}	30	V	
Drain-to-Source Voltage		Q2				
Gate-to-Source Voltage		Q1	V _{GS}	±20	V	
Gate-to-Source Voltage		Q2				
Continuous Drain Current R _{θJA} (Note 1)	Steady State	T _A = 25°C	Q1	I _D	13.5	A
		T _A = 85°C			9.7	
		T _A = 25°C			23.4	
		T _A = 85°C			16.9	
Power Dissipation R _{θJA} (Note 1)		T _A = 25°C	Q1	P _D	1.90	W
			Q2		2.07	
Continuous Drain Current R _{θJA} ≤ 10 s (Note 1)		T _A = 25°C	Q1	I _D	18.2	A
		T _A = 85°C			13.1	
		T _A = 25°C	Q2		30.3	
		T _A = 85°C			21.8	
Power Dissipation R _{θJA} ≤ 10 s (Note 1)		T _A = 25°C	Q1	P _D	3.45	W
			Q2		3.45	
Continuous Drain Current R _{θJA} (Note 2)		T _A = 25°C	Q1	I _D	10.3	A
		T _A = 85°C			7.4	
		T _A = 25°C	Q2		17.9	
		T _A = 85°C			12.9	
Power Dissipation R _{θJA} (Note 2)	T _A = 25 °C	Q1	P _D	1.10	W	
		Q2		1.20		
Pulsed Drain Current		T _A = 25°C t _p = 10 μs	Q1	I _{DM}	60	A
			Q2		100	
Operating Junction and Storage Temperature			Q1	T _J , T _{STG}	-55 to +150	°C
			Q2			
Source Current (Body Diode)			Q1	I _S	3.4	A
			Q2		4.9	
Drain to Source dV/dt				dV/dt	6	V/ns
Single Pulse Drain-to-Source Avalanche Energy (T _J = 25C, V _{DD} = 50 V, V _{GS} = 10 V, I _L = XX A _{pk} , L = 0.1 mH, R _G = 25 Ω)		24 A	Q1	EAS	28.8	mJ
		48 A	Q2	EAS	115	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)				T _L	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surface-mounted on FR4 board using 1 sq-in pad, 2 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size of 100 mm².

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	FET	Symbol	Value	Unit
Junction-to-Ambient – Steady State (Note 3)	Q1	$R_{\theta JA}$	65.9	°C/W
	Q2		60.5	
Junction-to-Ambient – Steady State (Note 4)	Q1	$R_{\theta JA}$	113.2	
	Q2		104	
Junction-to-Ambient – ($t \leq 10$ s) (Note 3)	Q1	$R_{\theta JA}$	36.2	
	Q2		36.2	

3. Surface-mounted on FR4 board using 1 sq-in pad, 2 oz Cu.

4. Surface-mounted on FR4 board using the minimum recommended pad size of 100 mm².

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	FET	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain-to-Source Break-down Voltage	Q1	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
	Q2		$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	30			
Drain-to-Source Break-down Voltage Temperature Coefficient	Q1	$V_{(BR)DSS} / T_J$			18		mV / °C
	Q2				15		
Zero Gate Voltage Drain Current	Q1	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		1	μA
				$T_J = 125^\circ\text{C}$		10	
	Q2	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		500	
				$T_J = 125^\circ\text{C}$		500	
Gate-to-Source Leakage Current	Q1	I_{GSS}	$V_{GS} = 0\text{ V}, V_{DS} = \pm 20\text{ V}$			± 100	nA
	Q2					± 100	

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	Q1	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$		1.2		2.2	V
	Q2				1.2		2.2	
Negative Threshold Temperature Coefficient	Q1	$V_{GS(TH)} / T_J$				4.5		mV / °C
	Q2					4.0		
Drain-to-Source On Resistance	Q1	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 10\text{ A}$		5.2	6.5	mΩ
			$V_{GS} = 4.5\text{ V}$	$I_D = 10\text{ A}$		8.0	10	
	Q2		$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}$		1.9	2.35	
			$V_{GS} = 4.5\text{ V}$	$I_D = 20\text{ A}$		2.8	3.5	
Forward Transconductance	Q1	g_{FS}	$V_{DS} = 1.5\text{ V}, I_D = 10\text{ A}$			28		S
	Q2					45		

5. Pulse Test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

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ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	FET	Symbol	Test Condition	Min	Typ	Max	Unit
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CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	Q1	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 15 V		1150		pF
	Q2				2950		
Output Capacitance	Q1	C _{OSS}			360		
	Q2				1100		
Reverse Capacitance	Q1	C _{RSS}			105		
	Q2				82		
Total Gate Charge	Q1	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 15 V; I _D = 10 A		9.7		nC
	Q2				20		
Threshold Gate Charge	Q1	Q _{G(TH)}			1.1		
	Q2				2.7		
Gate-to-Source Charge	Q1	Q _{GS}			3.3		
	Q2				7.3		
Gate-to-Drain Charge	Q1	Q _{GD}			3.7		
	Q2				5.3		
Total Gate Charge	Q1	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 15 V; I _D = 10 A		19.1		nC
	Q2				42.7		

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	Q1	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 10\text{ A}, R_G = 3.0\ \Omega$		9.0		ns
	Q2				14		
Rise Time	Q1	t_r			15		
	Q2				16		
Turn-Off Delay Time	Q1	$t_{d(OFF)}$			14		
	Q2				25		
Fall Time	Q1	t_f			4.0		
	Q2				7.0		

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	Q1	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 10\text{ A}, R_G = 3.0\ \Omega$		6.0		ns
	Q2				10		
Rise Time	Q1	t_r			14		
	Q2				15		
Turn-Off Delay Time	Q1	$t_{d(OFF)}$			17		
	Q2				32		
Fall Time	Q1	t_f			3.0		
	Q2				5.0		

5. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	FET	Symbol	Test Condition	Min	Typ	Max	Unit
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DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Voltage	Q1	V _{SD}	V _{GS} = 0 V, I _S = 3 A	T _J = 25°C		0.75	1.0	V	
				T _J = 125°C		0.62			
	Q2		V _{GS} = 0 V, I _S = 2 A	T _J = 25°C		0.45	0.70		
				T _J = 125°C		0.37			
Reverse Recovery Time	Q1	t _{RR}	V _{GS} = 0 V, dI _S /dI = 100 A/μs, I _S = 3 A			23		ns	
	Q2					40			
Charge Time	Q1	t _a				12			
	Q2					21			
Discharge Time	Q1	t _b				11			
	Q2					19			
Reverse Recovery Charge	Q1	Q _{RR}				12		nC	
	Q2					40			

PACKAGE PARASITIC VALUES

Source Inductance	Q1	L _S	T _A = 25°C		0.38		nH
	Q2				0.65		
Drain Inductance	Q1	L _D			0.054		nH
	Q2				0.007		
Gate Inductance	Q1	L _G			1.5		nH
	Q2				1.5		
Gate Resistance	Q1	R _G			0.8		Ω
	Q2				0.8		

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

6. Switching characteristics are independent of operating junction temperatures.

ORDERING INFORMATION

Device	Package	Shipping [†]
NTMFD4901NFT1G	DFN8 (Pb-Free)	1500 / Tape & Reel
NTMFD4901NFT3G	DFN8 (Pb-Free)	5000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

TYPICAL CHARACTERISTICS – Q1

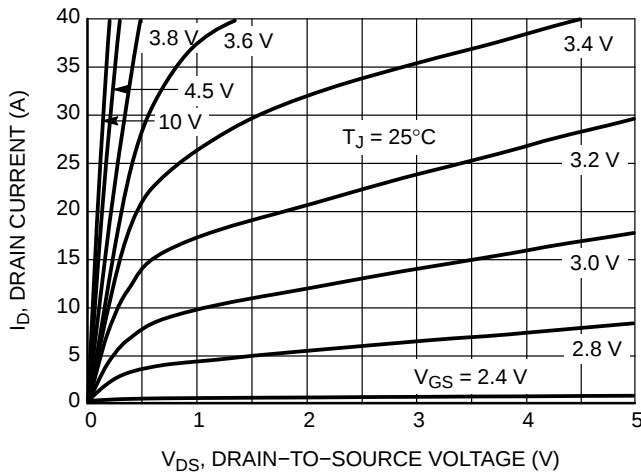


Figure 1. On-Region Characteristics

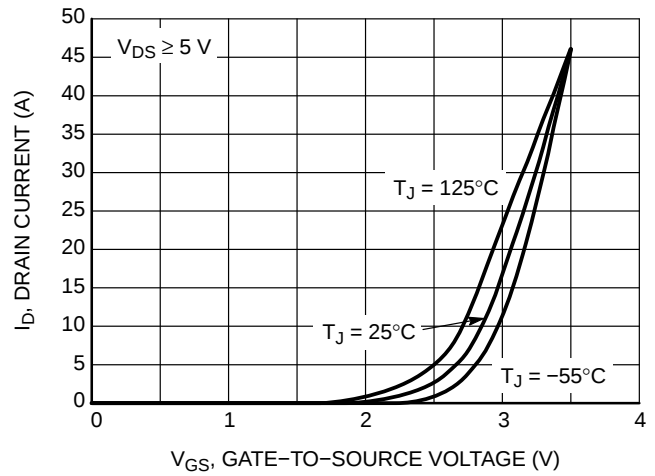


Figure 2. Transfer Characteristics

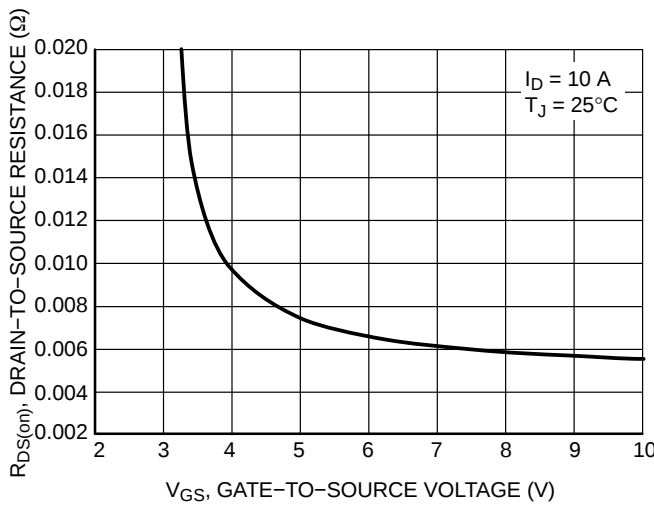


Figure 3. On-Resistance vs. Gate-to-Source Resistance

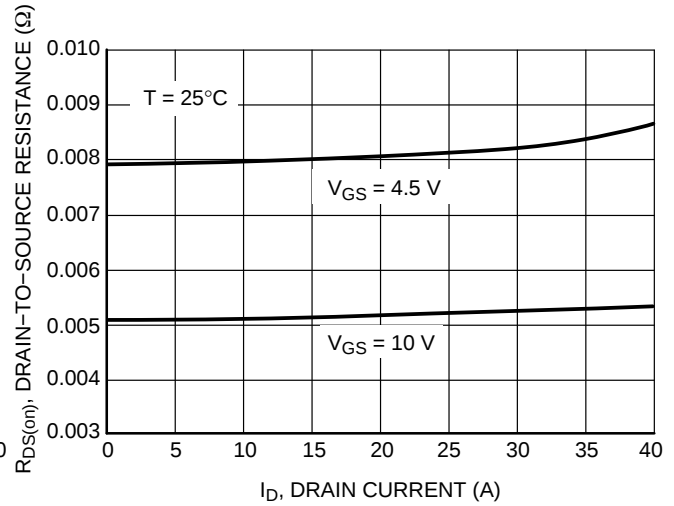


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

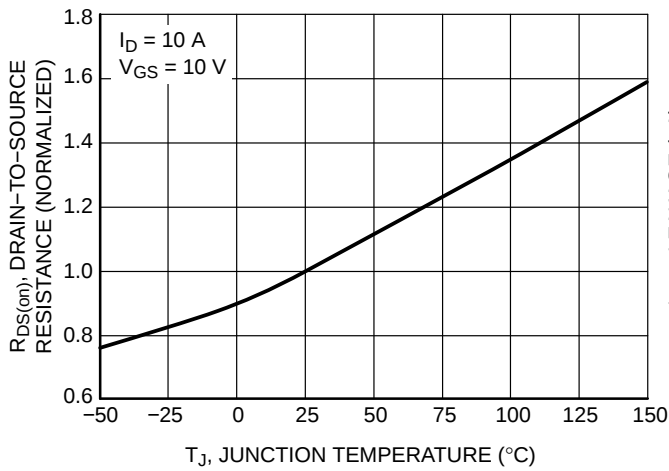


Figure 5. On-Resistance Variation with Temperature

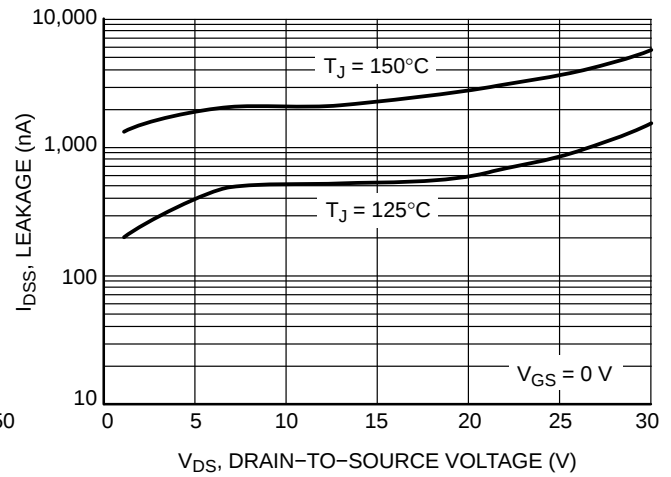


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – Q1

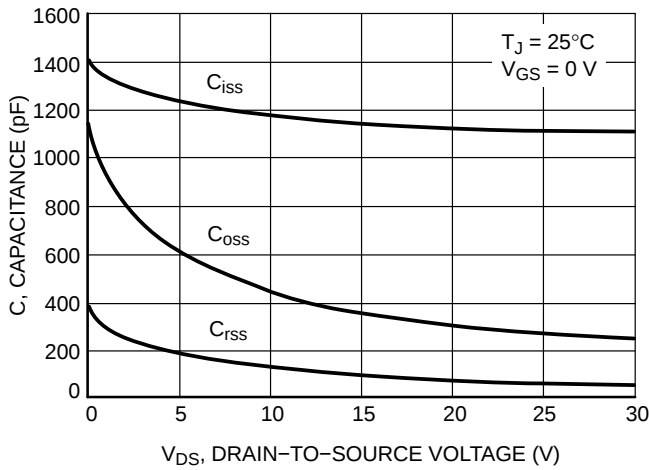


Figure 7. Capacitance Variation

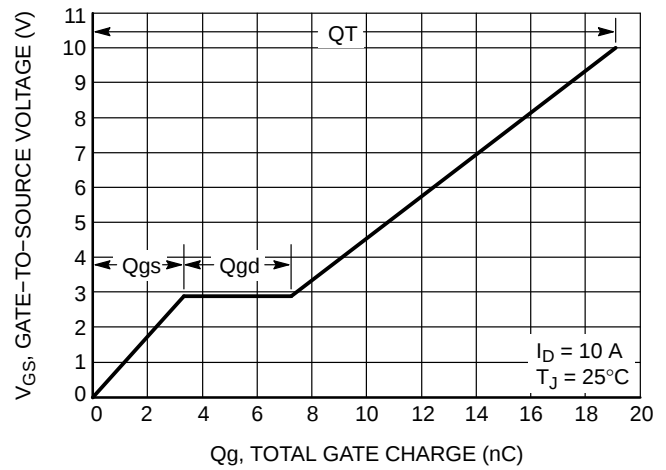


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

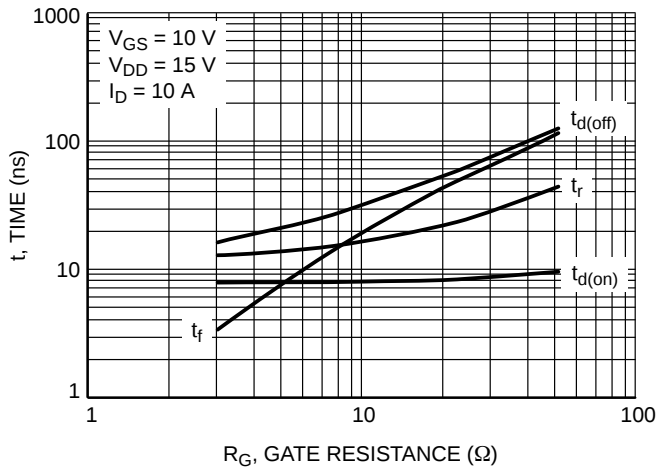


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

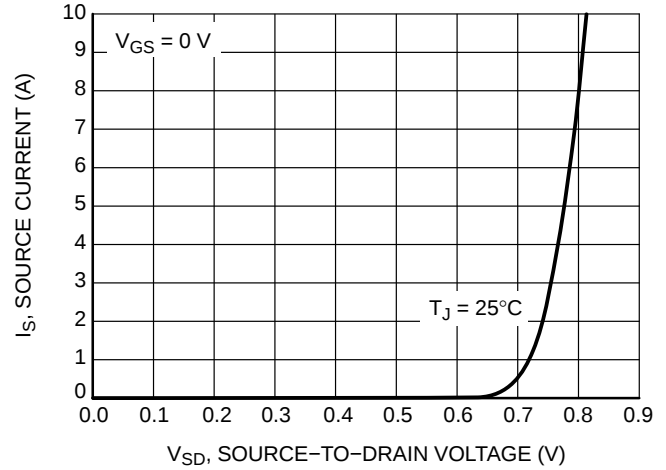


Figure 10. Diode Forward Voltage vs. Current

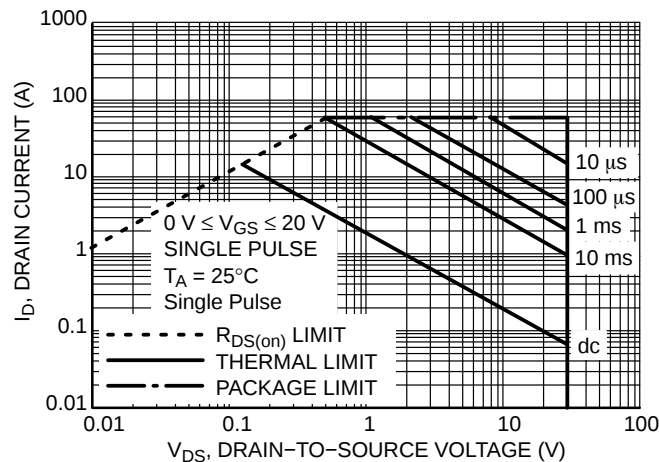


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTICS – Q1

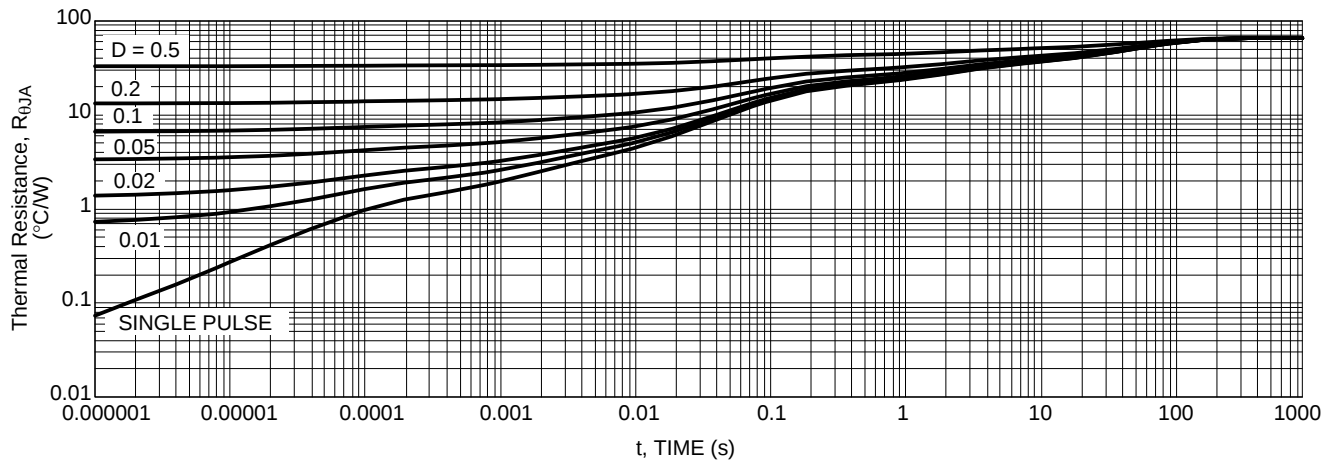


Figure 12. Thermal Response

TYPICAL CHARACTERISTICS – Q2

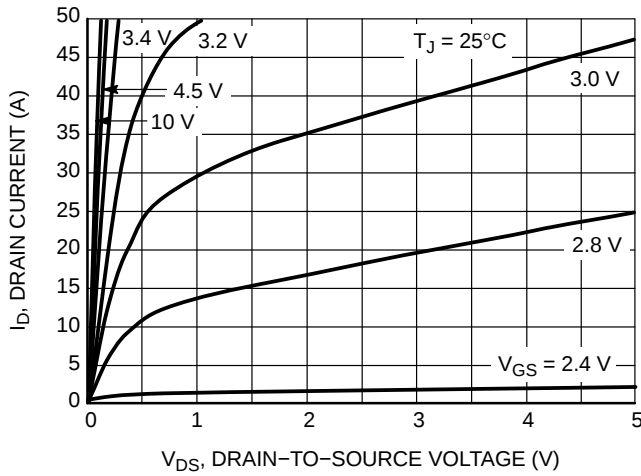


Figure 13. On-Region Characteristics

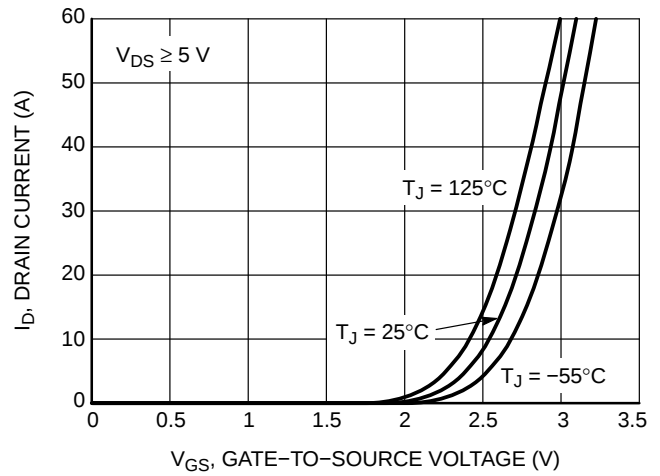


Figure 14. Transfer Characteristics

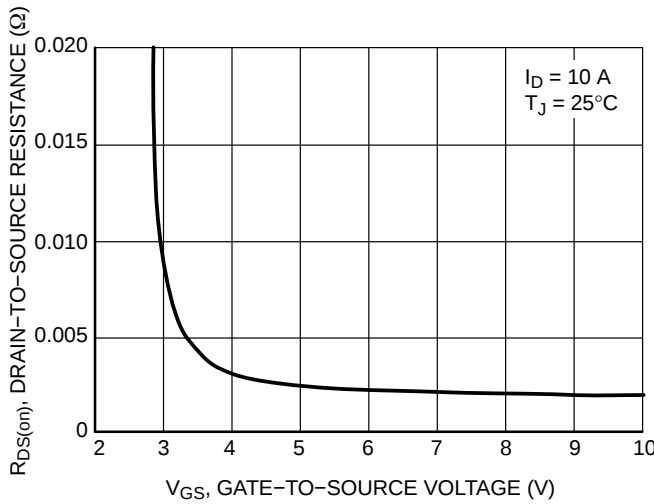


Figure 15. On-Resistance vs. Gate-to-Source Resistance

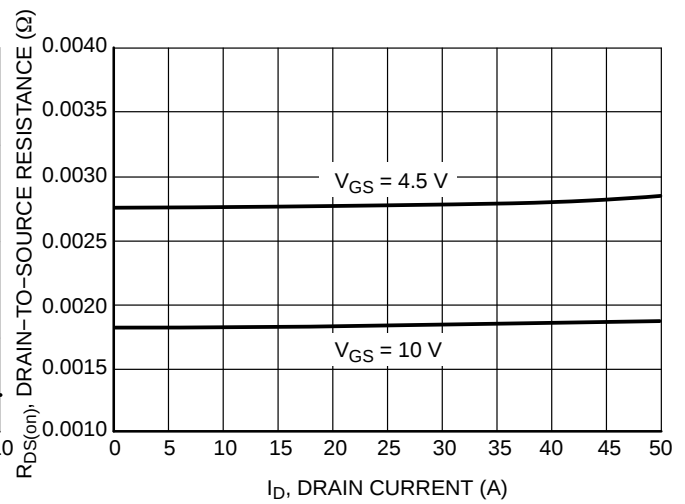


Figure 16. On-Resistance vs. Drain Current and Gate Voltage

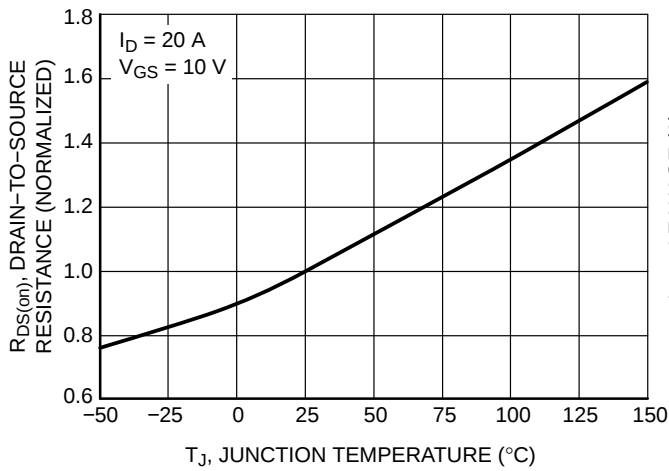


Figure 17. On-Resistance Variation with Temperature

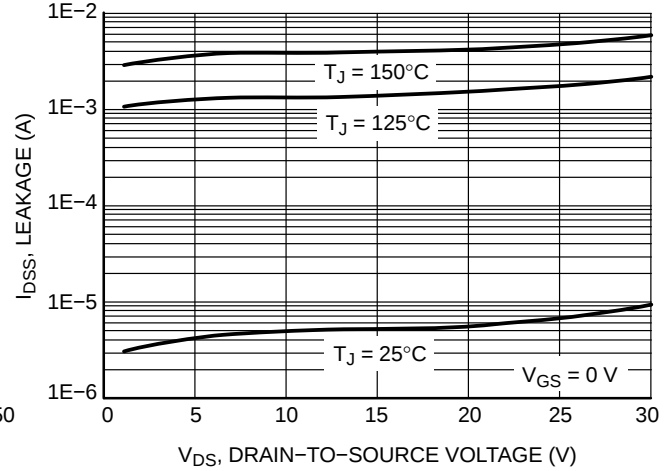


Figure 18. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – Q2

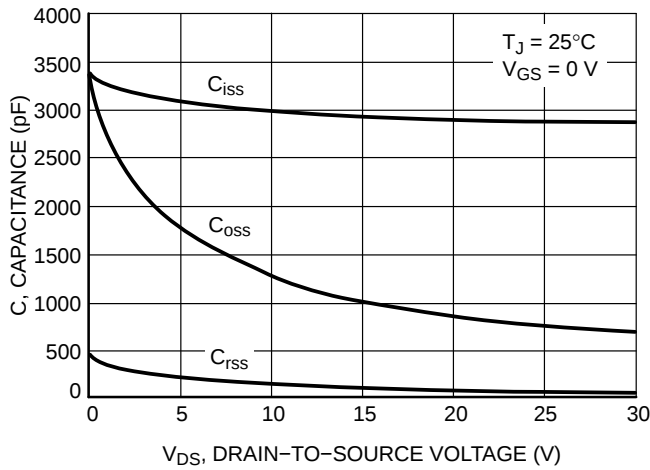


Figure 19. Capacitance Variation

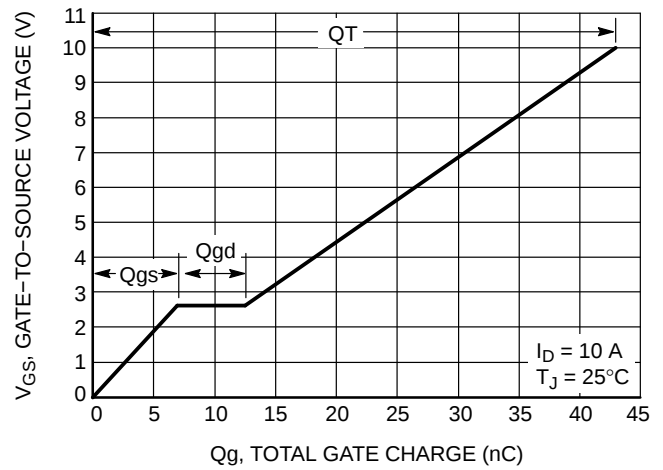


Figure 20. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

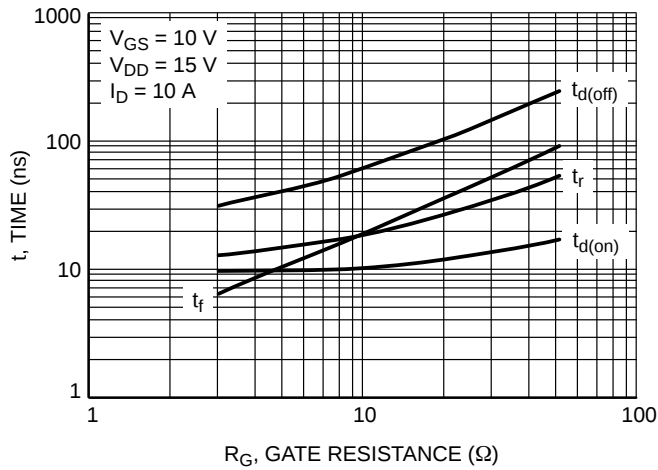


Figure 21. Resistive Switching Time Variation vs. Gate Resistance

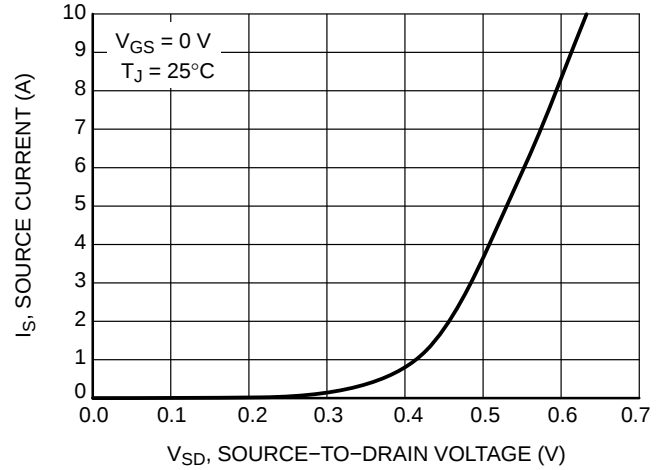


Figure 22. Diode Forward Voltage vs. Current

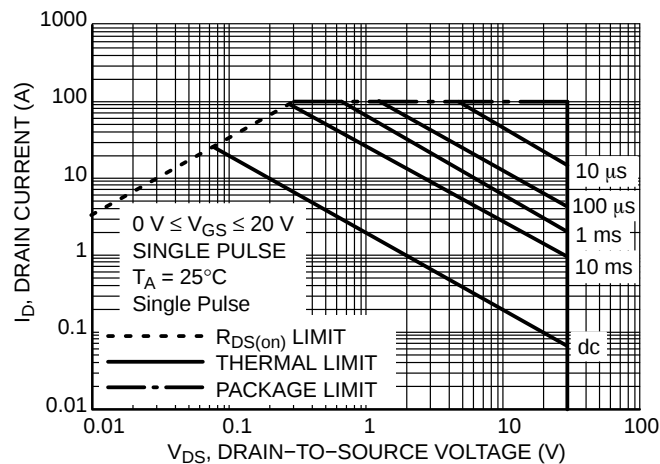


Figure 23. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTICS – Q2

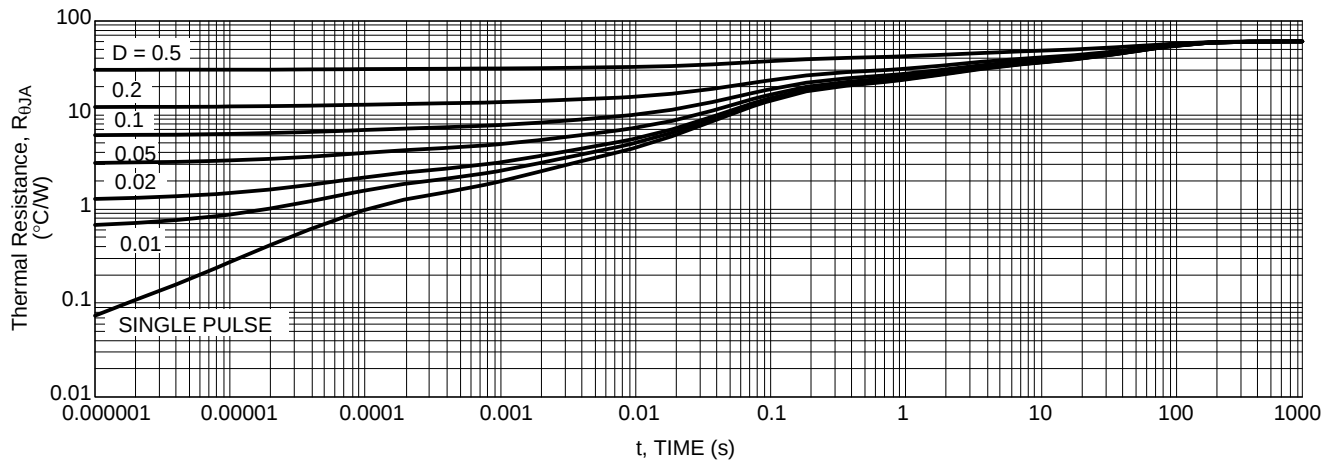


Figure 24. Thermal Response

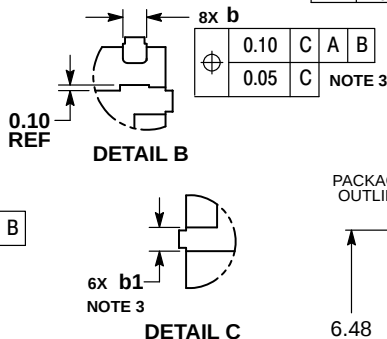
PACKAGE DIMENSIONS

ISSUE C

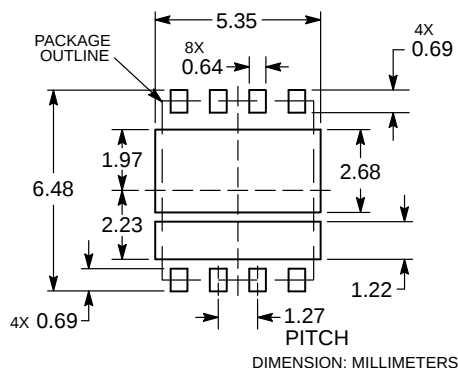


1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS b AND d1 APPLY TO PLATED FEATURES AND ARE MEASURED BETWEEN 0.15 AND 0.25 MM FROM TERMINAL TIPS.
4. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
5. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
6. SEATING PLANE IS DEFINED BY THE TERMINALS. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

DIM	MILLIMETERS	
	MIN	MAX
A	0.90	1.10
A1	0.00	0.05
b	0.41	0.61
b1	0.41	0.61
c	0.23	0.33
D	5.15 BSC	
D1	4.50	5.10
D2	3.50	4.22
E	6.15 BSC	
E1	5.50	6.10
E2	2.27	2.67
E3	0.82	1.22
e	1.27 BSC	
G	0.63 BSC	
G1	1.72 BSC	
h	---	12 °
l	0.35	0.55



3 RECOMMENDED SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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